

DOCUMENT RESUME

ED 318 500

JC 900 214

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TITLE A Method for Determining Valid Course Placements and Prerequisites: Findings & Recommendations from a Study of California Community Colleges.
PUB DATE 25 Apr 90
NOTE 31p.; Paper presented at the Annual Convention of the American Association of Community and Junior Colleges (70th, Seattle, WA, April 22-25, 1990).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)
EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS College Planning; Community Colleges; Educational Testing; *Predictive Measurement; *Predictive Validity; *Prerequisites; Student Attitudes; *Student Evaluation; *Student Placement; Teacher Attitudes; Two Year Colleges

ABSTRACT

In 1987, Santa Barbara City College, California, received a grant to develop valid and culturally fair assessment procedures for placing students into appropriate level courses. Specifically, the project sought to: (1) determine faculty and student perceptions of the skills needed to succeed in entry-level college classes; (2) examine the relationship between assessment test scores and grades; (3) develop statistical procedures to identify multiple variables for predicting students' grades; (4) establish procedures for determining valid prerequisites for entry-level, degree-applicable courses based on assessment test scores and other educational and demographic variables; (5) determine whether the procedures used to place students into courses systematically discriminate against students in any ethnic group; (6) develop a means for communicating to faculty, counselors, and students the probability of students succeeding in particular courses based on assessment scores and educational background characteristics; (7) identify the implications of the study; and (8) provide information on the replication of the project at other colleges. Surveys were administered to students and faculty members in a sample of precollegiate and entry-level courses at eight California community colleges. Based on surveys completed by 24,000 students and 1,600 faculty members, a series of 12 recommendations were developed. The study report includes findings and recommendations, and discusses the implications for assessment, orientation and advisement, instruction, and research. (JMC)

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INTRODUCTION

In the summer of 1987 the Chancellor's Office of the California Community Colleges awarded a Fund for Instructional Improvement Grant to Santa Barbara City College to develop valid and culturally fair assessment procedures for placing students into appropriate level courses.

The project was conducted by a consortium of the following community colleges: Allan Hancock College, College of the Sequoias, Compton College, Long Beach City College, Mesa College, Miramar College, Santa Barbara City College and San Diego City College. The colleges participating in the project were selected on the basis of common data collection procedures, ethnic diversity of students, geographic location (rural, urban, and suburban) and size.

OBJECTIVES OF THE PROJECT

The primary objective of the project was to provide colleges a guide for establishing well-conceived assessment procedures and fair and meaningful course requisites that are consistent with the California Community Colleges' Board of Governors' Matriculation Plan. Specific objectives were as follows:

- ★ Determine faculty and student perceptions of skills needed to succeed in entry-level college classes.
- ★ Examine the relationship between scores on assessment tests and grades.
- ★ Develop statistical procedures to identify multiple variables for predicting students' grades.
- ★ Establish procedures for determining valid prerequisites for entry-level, degree-applicable courses based on assessment test scores and other educational and demographic variables.
- ★ Determine whether the procedures used to place students into courses systematically discriminate against students in any ethnic group.
- ★ Develop a means for communicating to faculty, counselors and students the probability of students succeeding in particular courses based on assessment scores and educational background characteristics.
- ★ Identify the implications of the study for assessment, orientation and advisement, instruction, and research.
- ★ Provide information on how the procedures used in this project can be replicated at other colleges.

Specific questions to be answered were:

- * Which skills do faculty and students perceive as important for success in particular courses?
- * Are the assessment tests used to place students in courses good predictors of students' success in those courses?
- * To what extent are the recommended skills levels for a course related to students' chances of successfully completing the course?
- * What are the success rates of students who enroll in courses contrary to the advice provided by the college?
- * Is it better to use multiple variables for placing students in courses? If so, how do we determine what variables are the best predictors of students' success in particular categories of courses?
- * Are the assessment tests and course placement procedures biased against students from different ethnic and linguistic groups?
- * How can the assessment and background information be used to make decisions regarding course placements?

PROCEDURES

The procedures used to address the questions noted above are described in this report. A detailed description of the procedures is provided in two technical reports entitled, "Preparing Data Needed for Predicting Students' Success in College Courses" (*Kelemen-Lohnas & Elmore, 1989*) and "Facilitating Placement of Students in Entry-Level College Classes" (*Kelemen-Lohnas, 1990*).

Procedures for determining faculty and student perceptions of the skills needed to succeed in their courses.

A task force from the project colleges developed student and faculty surveys that included specific skills thought to be important for students to complete courses successfully. These skills included reading, writing, math, listening, speaking, critical thinking and study skills. The surveys were administered to students and faculty members in a sample of pre-collegiate and entry-level, degree-applicable courses at each of the colleges during the eighth week of the 1987 fall semester (*Attachments A and B*).

The students were asked to rate the degree of importance of 14 skills for earning a grade of "C" or better in the course in which the survey was administered. They were also asked to rate their competence in each of the skill areas. Additionally, students in English and math classes were asked to indicate whether or not they thought they were appropriately placed in that course.

Course Placement & Prerequisites

The faculty were given a parallel survey which they completed at the same time as the students. They were asked to indicate how important each of the 14 skills was for students to succeed in their course and the students level of competence in each of the skill areas. English and math faculty were also asked to indicate the percentage of students appropriately placed in their courses.

Completed surveys were received from approximately 24,000 students and 1,600 faculty in the eight project colleges. The data from the surveys were used to compare faculty and student perceptions of the skills necessary for success in particular courses. Students' perceptions of their skills were compared with actual placement levels based on assessment test results.

Which skills do students and faculty perceive as important for success in particular classes?

With the exception of reading and study skills, the skills perceived to be important for success varied from subject to subject and college to college. A skill was considered as important if 70% or more of the students and faculty rated it as "important" or "very important" to succeed in a particular class.

Business Cluster: Students and faculty agreed that the following skills were important for succeeding in their business courses: reading, speaking and listening, drawing reasonable conclusions and study skills. Faculty differed from students in that they rated grammar and critical thinking skills as important.

Social Science Cluster: Both faculty and students in all of the colleges agreed that reading, understanding lectures, reasoning and study skills were important in succeeding in social science classes. There was a great deal of variation among colleges on the importance assigned to writing, speaking and listening skills.

Music Appreciation: There was a consensus among students and faculty on the importance of reading, study skills and identifying main points in a lecture or discussion. Faculty, but not their students, thought the following skills were needed to succeed in their classes: presenting ideas in writing, using correct grammar, and reasoning.

Course Placement & Prerequisites

Accounting: There was concurrence among students and faculty on the importance of reading, mathematics, problem solving skills and study skills. There was also agreement on the importance of the ability to answer and ask questions in class, identify and understand main points in lectures and draw conclusions.

Introductory Spanish: The skills identified by both faculty and students as being important for succeeding in Spanish classes were reading, speaking, listening and study skills. In addition, faculty, but not students, thought that the ability to draw reasonable conclusions was important.

Chemistry: Students and faculty in introductory chemistry courses agreed on the importance of the following skills for succeeding in their classes: reading, answering and asking questions in class, understanding main points in a lecture, applying mathematics, solving problems, interpreting graphs and charts, and possessing study skills.

U.S. History: The following skills were identified by both faculty and students as being important to succeed in U.S. history: reading, writing and grammar, identifying main points in a discussion, drawing conclusions and using study skills. In addition, faculty members, but not their students, assigned a high degree of importance to writing term papers, speaking and listening skills, distinguishing between fact and fiction and interpreting graphs and charts.

Recommendation 1

In addition to assessing students' reading, writing and math skills, colleges should include measures of reasoning, speaking, listening and study skills in their procedures for establishing recommendations for course placements. Ideally, such information would be obtained from valid assessment instruments designed to measure competencies in these areas. However, this may be impractical given the length of time and resources required to administer such tests. Therefore, colleges should be cognizant that measures of reading, writing and study skills do not cover the full range of competencies needed to succeed in most classes.

Recommendation 2

The skills students and faculty identified as being necessary to succeed in a course varied from subject to subject. For example, math skills were regarded as important for succeeding in chemistry and physics classes, but not for biology and earth science classes. Such information should be made available to students at the times of course selection.

To what extent did students feel they were appropriately placed in English and math classes? To what extent do English and math faculty feel that students were appropriately placed into their classes?

When asked during the eighth week of the semester whether or not students were appropriately placed into their English or math classes, more than 80% of students and faculty answered in the affirmative. As shown in *Table 1* the high degree of satisfaction with course placements held for all ethnic groups.

Of those students who were not satisfied with their course placements, most thought they should be at a higher level. This is particularly true among Asian students enrolled in pre-college level math classes.

Table 1
Student Satisfaction with Placement in
Beginning Algebra
 (N=612)

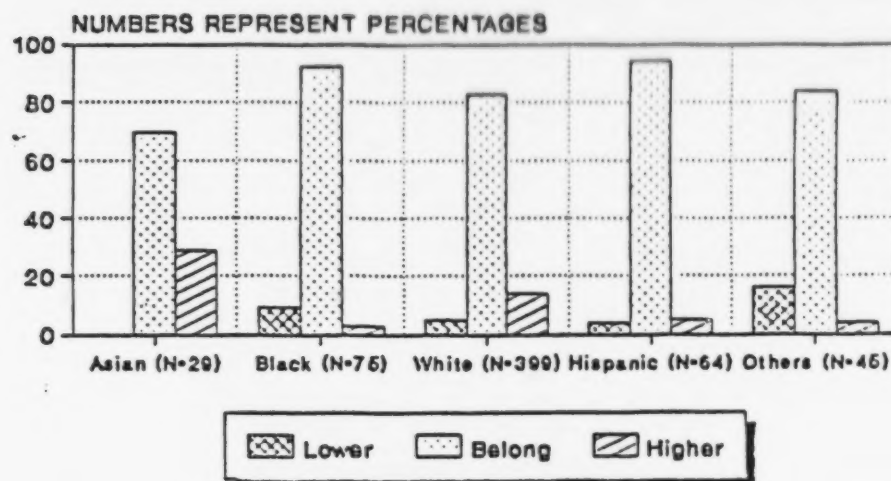
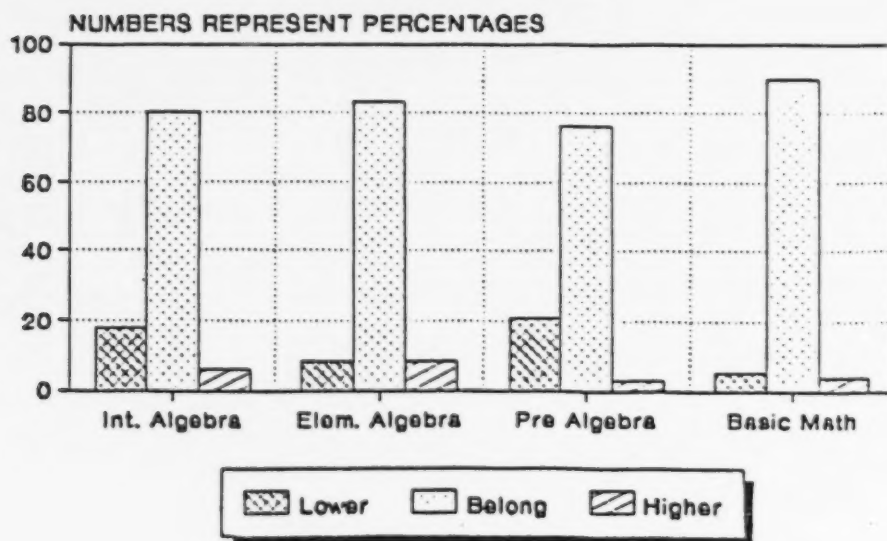


Table 2
Math Faculty Opinion of Student Placement in
Beginning Algebra



As illustrated in *Table 2*, there was some variation within each of the colleges in the percentage of students faculty thought should have been placed at a lower level. In some cases the numbers of students faculty believed were inappropriately placed in their courses exceeded 20%.

Recommendation 3

Colleges should examine the relationship between the assessment test and course content in those classes where faculty felt that more than 20% of their students were inappropriately placed.

There are a number of reasons that may account for the finding that in some classes faculty felt more than 20% of their students were inappropriately placed. These factors include: (1) the need to raise cut-off scores; (2) lack of congruency between the English or math skills measured by the assessment test and the skills needed to succeed in particular courses; and/or (3) the possibility that the factors used in recommending course placements did not include other essential skills needed to succeed in those classes (e.g., time management, reasoning skills).

If Asian students are not satisfied with their placement in math classes, colleges should examine the extent to which language skills affect students' performance on the math assessment test. Deficiencies in language skills may result in a lower level placement in math than is warranted by the students' math skills. If there is a strong relationship between language skills and performance on the math placement test, colleges should encourage students to enroll in English classes in conjunction with their math class.

Procedures for determining the relationship between assessment scores and grades.

Student placement levels in reading, writing and math were compared with actual grades students received in a variety of courses across the curriculum. These cross-tabulation analyses were based on data collected during the 1987-88 and 1988-89 academic year. The relationship between students' scores on the assessment tests and their grades in particular courses was examined. The pass rates of students who would have been advised to enroll in a particular course and the pass rates of those who would not have been advised to enroll in that same course were also determined.

The cross-tabulation analyses were also used to compare the grades of students in various ethnic groups who had comparable scores on the assessment tests. This was one of the approaches taken to determine if bias existed in college placement practices for students in particular ethnic groups.

Are scores on English and math assessment tests related to students' grades in entry-level college courses?

Yes, new students who had college-level skills in reading, writing and/or math were more likely to pass their class than those in the same class whose skills were one level below college level. Similarly, students whose skills were one level below college level were more likely to receive a passing grade than those few students whose skills were two or more levels below college level. This finding held for students in different ethnic groups.

Table 3
Relation Between Assessment Scores and Grades for New Students at Eight Colleges

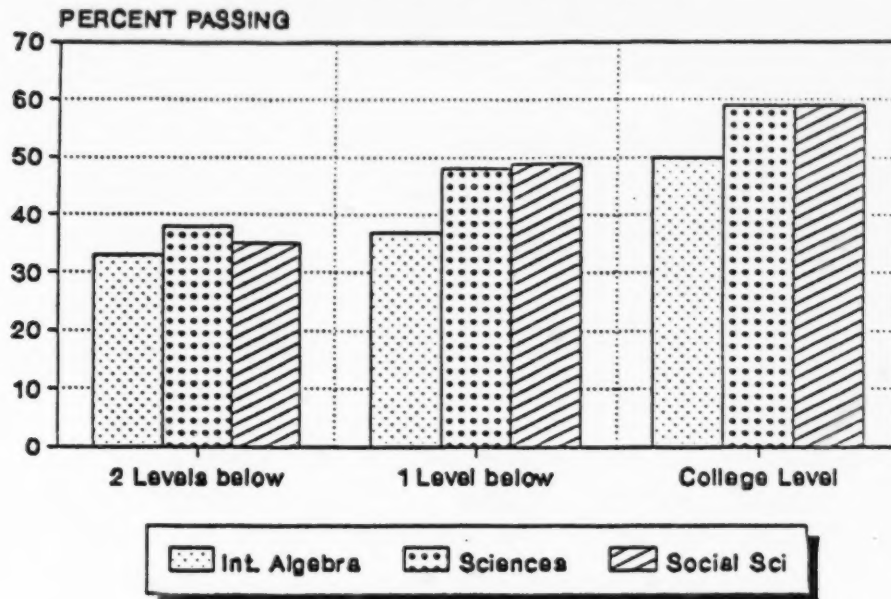


Table 4
Relationship Between Students' Math Test Scores and the Percent of New Students Who Received Passing Grades in Beginning Accounting at SBCC

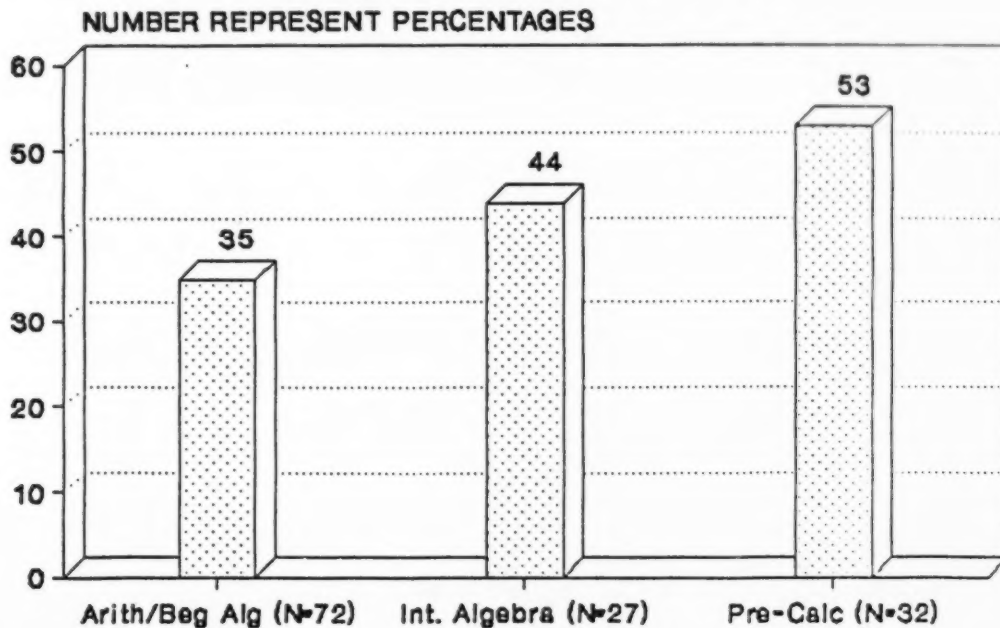


Table 5

Relationship Between Students' Writing Levels and the Percent of New Students Who Received a Passing Grade in Introduction to Political Science at SBCC

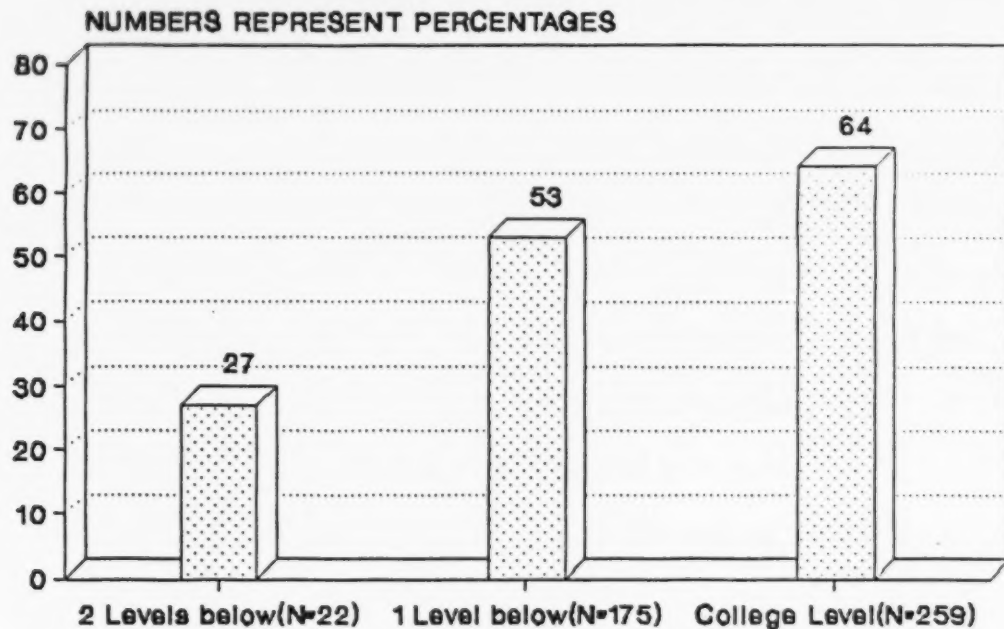
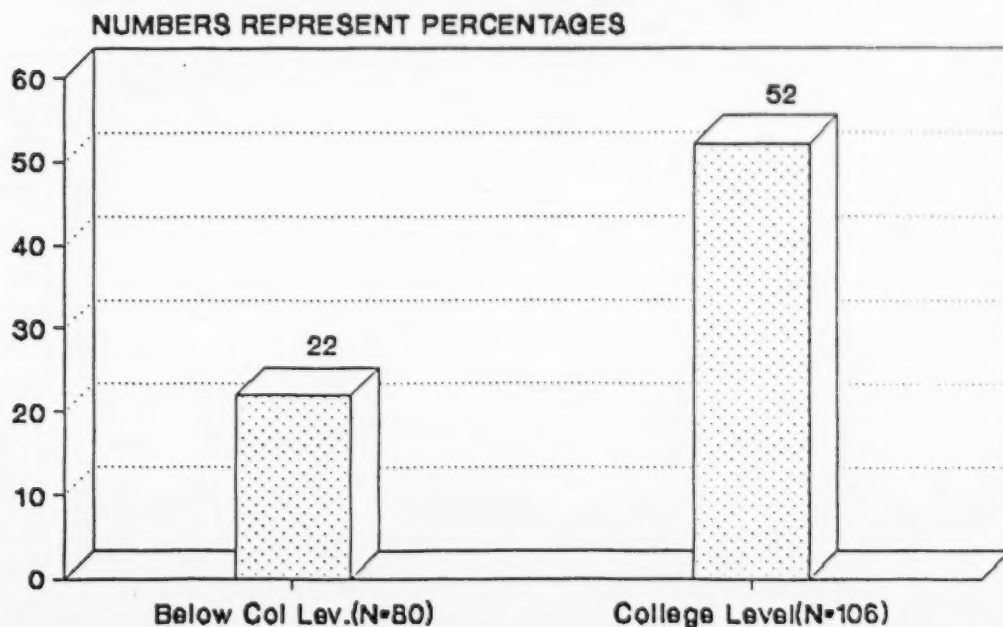


Table 6

Relation Between Students Reading Levels and the Percent of New Students who Received a Passing Grade in Introduction to Philosophy at SBCC



Recommendation 4

For many courses, scores on assessment tests should be used in conjunction with other information in determining course placement decisions.

Do students follow the advice provided by colleges regarding the courses in which they should enroll?

Yes, the overwhelming majority of students enrolled in courses that were recommended on the basis of their scores on the reading, writing and math assessment tests. For instance, of the 3,958 students enrolled in social science classes, only 8% had scores below those recommended for entry.

Recommendation 5

Since students are following advice regarding course placements and since the ability to predict student grades is not perfect, course placement schemes for most courses should remain advisory. Colleges should inform students with skills deficiencies of the low probability of passing most college level courses. Furthermore, they should strongly encourage these students to seek needed remediation.

Procedures for identifying and using multiple variables for predicting students' grades and for making course placement decisions.

A retrospective study based on data collected from the 1987-88 and 1988-89 academic years was conducted to examine the relationship between the variables listed below and students' grades in classes. The variables were obtained from assessment tests, student responses to the colleges' applications for admissions, and the assessment questionnaires (*Attachment C*). Additional information describing these variables is available in the technical report for this study (*Kelemen-Lohnas & Elmore, 1989*).

***LIST OF VARIABLES USED TO PREDICT
STUDENTS' GRADES***

1. Students' scores on standardized assessment tests in English, reading and math
2. Student background characteristics (i.e. ethnicity, age, gender, veteran status and citizenship)
3. Verified learning disability
4. Educational background information:
 - a. Length of time out of school
 - b. Highest level of educational attainment
 - c. Years of English completed in high school
 - d. Grade received in last English class completed
 - e. High school grade point average
 - f. Highest level of math class completed
 - g. Grade received in last math class completed
 - h. Length of time since student completed his/her last math class
5. College plans, including:
 - a. Time of day attending classes (day, evening, day/evening)
 - b. Number of units planned for term
 - c. Number of hours employed while in college
 - d. Primary educational goal
 - e. Major field of study
 - f. How definite is the choice of major
 - g. Importance of attending college to people closest to the student
 - h. Importance of attending college to the student

Why was logistic regression chosen over multiple regression as the appropriate method for predicting students' grades?

The original design for the project called for using student test scores and background characteristics to predict students' grades in their courses. The appropriate statistical technique for this type of design is multiple regression.

As the project unfolded, we realized that the accuracy of our findings would be called into question if we tried to predict whether a student received an "A," "B," "C," "D," "F," or "W" in a particular course. After all, the difference between an "A" and "B" or a "B" and "C" is often subtle and varies a great deal from instructor to instructor teaching the same course. Therefore, it was decided to identify variables that best predicted whether or not a student would receive a grade of "C" or better in a particular course. Since the dependent variable became a categorical ("C" or better versus "D," "F," "W," or "NC") rather than a continuous variable ("A - F"), the appropriate statistical analysis was no longer multiple regression but rather logistic regression.

The software used in this study was LOGIT, a supplementary module for SYSTAT (Steinberg and Colla, 1990). Additional information describing the logistic regression statistical procedure used in this study is provided in the technical reports for this study (Kelemen-Lohnas and Elmore, 1989; 1990).

How should grades of "W" and "D" be treated?

The next problem we encountered had to do with the "W" (withdrawal) grade. Should "W" be treated as a course failure or should it be dropped from the analyses? Results of the logistic regression analyses showed that the accuracy of predicting whether or not a student would earn a grade of "C" or better was substantially greater when "W" grades were excluded from the "D," "F," "NC" category. This is because students may withdraw from a course for a variety of reasons, some of which may have no connection with their ability to complete the coursework. Thus the decision was made to treat "W" grades as a separate category.

The question of whether to place a grade of "D" in the successful course completion category or in the non-successful course completion category was explored. The findings of the analyses showed that the accuracy in predicting students' success in their courses was higher when "D" grades were placed in the category containing the "F" and "NC" grades than when they were placed in the "A to C" category.

How can multiple criteria be used to make course placement decisions?

Once the best predictors for student success in a course are identified through the step-wise LOGIT regression, they are entered into an equation that produces predicted probabilities of a student receiving grades of A-C, D-F, or W. For example, for placement into intermediate algebra, the best predictors were test score on the math test, high school grade point average and highest level math class completed. Examples of the application of this procedure are provided in this report. A detailed description of this procedure is provided in Kelemen-Lohnas, 1990.

Is the accuracy of predicting students' grades in courses increased by using multiple variables instead of test scores alone?

For many courses, the use of multiple criteria increased the accuracy of predicting students' grades compared to the colleges' existing placement schemes. As shown in Table 7 the gains in accuracy of predicting students' success in courses ranged from 0 to 44%. The average gain in accuracy for the 14 courses examined was 18%.

Guide for Reading Table 7

- ★ *Column 1.* Name of the course.
- ★ *Column 2.* Number of new students enrolled in course.
- ★ *Column 3.* Percentage of new students who received a passing grade under the existing system of using assessment scores for advising students in course selection.
- ★ *Column 4.* The percentage of students predicted to pass a course who actually did pass if multiple criteria had been used. For example, of those students predicted to pass Introduction to Accounting, 60% did so.
- ★ *Column 5.* Overall accuracy in predicting whether students would receive a grade of A-C, D-F, or W using multiple criteria.
- ★ *Column 6.* Overall gain in accuracy of predicting performance of new students. For example, using multiple criteria we were able to predict student performance in Introduction to Accounting with 68% accuracy compared to 41% accuracy when using test scores alone to advise students.

TABLE 7
Predicting Grades Using Multiple Criteria

<u>Course</u>	<u>N</u>	<u>% Passed</u>	<u>% Passed Mult Crit</u>	<u>% Accuracy Mult. Crit.</u>	<u>Gain in Accuracy</u>
Real Estate	75	37%	48%	61%	+24%
Intro to Phil.	187	39%	56%	66%	+27%
Physics & Chem.	90	40%	61%	69%	+29%
Int. Algebra	265	39%	59%	67%	+28%
Spanish	999	53%	55%	56%	+3%
Col. English	910	63%	66%	65%	+2%
Intro. to Soc	126	45%	54%	60%	+15%
Elem. Algebra	412	33%	56%	68%	+35%
Intro to Psych	282	67%	69%	69%	+2%
Accounting	127	41%	60%	68%	+27%
Intro. to Bio.	137	68%	68%	68%	0
Economics	112	28%	52%	72%	+44%
U.S. History	212	55%	63%	61%	+6%
Pol Sci	440	59%	64%	66%	+7%

TABLE 8

Best Predictors of Students' Grades in Selected Classes at SBCC

<i>Course</i>	<i>Best Predictors</i>
Real Estate	Age, units, full time, importance of college to student
Intro to Phil.	Reading and English test score & math placement level
Physics & Chem.	Reading test score & math placement level
Int. Algebra	High school GPA, score on math test & highest level math class completed
Spanish	High school education
College English	English test score, high school GPA, hours employed, importance of college to others
Intro. to Soc	Highest level math class
Elem. Algebra	Math test score & age
Intro to Psych	Age, math placement level, importance of college to others
Accounting	Grade in last math class, Hours employed, units planned, math placement level
Biology	Units planned & English test score
Econ.	English test score, units & employed hours.
U.S. History	High school GPA, hours employed, math placement level
Pol Sci	Reading score, high school GPA, & hours employed

Recommendation 6

Colleges should analyze their data using logistic regression to determine if using multiple criteria contributes to the ability to predict students' grades over existing placement practices. If so, the best variables for predicting student success should be used in the determination of recommended course placements. For example, using multiple criteria allowed us to increase the accuracy of predicting student performance in Introduction to Accounting by 27%.

The best predictors were grade in last math class, math placement level (intermediate algebra), and the interaction of the number of college units planned and the number of hours employed during a students' first semester in college. Thus it would be appropriate for the college to use these multiple criteria for advising students whether or not to enroll in Introduction to Accounting.

However, if colleges find that the use of multiple criteria does not add to the accuracy of predicting student success for some courses, it may be that those variables are already taken into account in the existing advising practices. To illustrate, in the case of the freshman composition class, nearly all of the students entered with the requisite scores on the English placement test.

Therefore students possessed the minimum reading and writing skills needed to succeed in freshman composition. Additional variables contributed very little to the overall accuracy of predicting student performance. For freshman composition the best predictor is the English placement test.

This does not mean that colleges should be complacent. Given the rather modest pass rates of first semester students, colleges should examine other factors that may influence grades, such as study skills and motivation. If these factors prove to be related to student success, then they should be addressed by faculty in their courses.

In the case of Spanish none of the variables added much to the ability to predict student performance. This may be because none of the variables measured were directly related to the competencies needed to succeed in a foreign language class.

What are the best predictors of student success?

The variables used to predict student grades varied from college to college and from course to course. However, of the 60 variables examined, the 10 variables listed in *Table 9* were most commonly found to be the best predictors of students' grades. It should be noted that ethnicity was not a significant variable.

Table 9

Ten Best Predictors of Students' Grades

- ☆ English test score
- ☆ Reading test score
- ☆ Math test score (or math level)
- ☆ High school GPA (self-reported)
- ☆ Age
- ☆ Units planned
- ☆ No. of hours employed
- ☆ Highest math class completed
- ☆ Importance of college to student
- ☆ Importance of college to those closest to student

Recommendation 7

Colleges need to identify their own set of predictor variables based on information they collect from students. There is no universal set of factors that predict success for all students in all courses at all colleges. However, the variables noted above should be considered when colleges examine their own data.

What percentage of the students predicted to pass a course did not do so (false positives)?

The greatest error in predicting grades in courses occurred because students predicted to pass a course with a grade of "C" or higher actually received a grade of "D", "F", "NC", or "W". This error in prediction is called a "false positive." Based on the assessment and educational background characteristics collected, there was every reason to believe these students would successfully complete their

course. *Table 10* shows the range in the percentage of false positives for a sample of courses at the eight project colleges. To illustrate, the percentage of false positives in beginning algebra ranged from a low of 21% at one college to a high of 44% at another. In most instances, more than 30% of the students predicted to pass a particular course did not do so.

Table 10
Range of False Positives Among Colleges

	Low	High
Beginning Algebra	21%	44%
Intermediate Algebra	23%	43%
Science Classes	14%	43%
College English	19%	37%
English One Level Below	21%	42%
Business	14%	52%
Social Sciences	19%	45%

Recommendation 8

Many factors may have accounted for the high rate of false positives. They include inappropriate cut-off scores, exclusion of important variables from the prediction equations that may have been highly correlated with students' grades, and/or the need for some adjustments in advising and instructional practices.

Colleges should consider taking the following actions to increase students' chances of succeeding in their courses.

- ★ Re-examine cut-off scores on assessment tests used for recommending course placements.
- ★ Consider such factors as the interaction of the number of hours employed and number of units enrolled when advising students regarding course selection.
- ★ Examine instructional practices that may contribute to or detract from student success. For example, incorporate the teaching of study skills into introductory college courses.

Course Placement & Prerequisites

- ★ Examine institutional practices designed to facilitate student retention. Such practices may include the availability of support services, encouragement of student involvement in course-related activities, and promotion of frequent student interactions with faculty and staff.

Even if all of these recommendations are followed, there will always be a certain percentage of students capable of passing a class who will withdraw for reasons beyond the college's control.

What percentage of the students predicted not to succeed in a course were able to pass the course (false negatives)?

A critical concern in placing students into courses is to minimize the number of students the college would exclude from a course which they could pass (*false negatives*).

As shown in *Table 11*, if the colleges had used multiple criteria for advising students, less than 10% of the students who would have been advised not to enroll in a college-level course would have passed. Thus by using multiple criteria, the colleges would have been able to minimize false negatives.

Table 11
Percentage of Students Predicted to Do Poorly in a Class
Who Would Have Passed that Class if Multiple Criteria
Had Been Used

<i>Courses</i>	<i>Colleges</i>						
	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>G</i>
Business	0%	0%	1%	8%	0%	2%	--
Beg. Algebra	10%	3%	9%	13%	3%	8%	4%
Int. Algebra	9%	2%	--	12%	9%	8%	7%
English	4%	1%	11%	1%	1%	2%	5%
Social Sci.	0%	1%	6%	2%	4%	0%	1%
Sciences	3%	19%	14%	0%	0%	1%	--

Recommendation 9

In order to avoid denying access to students who can succeed, colleges need to minimize the number of false negatives in their course placement schemes.

Are there differences in the accuracy of predicting course grades for students in different ethnic groups?

Within certain colleges the accuracy of predicting students' grades varied by ethnic group. In most instances, where there were significant differences, predictions of course grades were more accurate for white and Asian students than for Hispanic and black students. It is important to note that discrepancies in the ability to predict grades of students within a particular college did not hold for all disciplines. In fact, the accuracy in predicting grades was not universally higher or lower for any particular ethnic group at any college.

Table 12
Comparison of Accuracy in Predicting Course Grades by
Ethnic Group (based on a sample of colleges)

	<u>Col. Eng</u>	<u>Beg. Algebra</u>
<u>College A</u>		
White	72%	58%
Hispanic	57%	47%
Others	66%	61%
<u>College B</u>		
White	69%	65%
Hispanic	49%	57%
Black	53%	62%
Asian	82%	79%
Others	64%	55%
<u>College C</u>		
White	60%	52%
Hispanic	59%	52%
Blacks	55%	--
Others	55%	--

Recommendation 10

The fact that in some cases there were differences in the accuracy of predicting grades for different ethnic groups does not necessarily imply that the assessment tests or advising are biased. This is particularly true since the accuracy of predicting grades was not consistently better or worse for any ethnic group at any given college. It could be attributed to the lack of correspondence between skills measured on assessment tests and those needed to succeed in the course. In addition, institutional and instructional practices may account for these differences.

Are there differences among colleges in the accuracy of predicting students' grades in courses?

As illustrated in *Table 13*, there were substantial differences among colleges in their ability to accurately predict student performance. For example, in college English, the accuracy of predicting student performance ranged from 51% at one college to 73% at another.

Table 13
Accuracy in Ability to Predict Students' Grades

<u>Course</u>	<u>Lowest</u>	<u>Highest</u>
Int. Algebra	56%	68%
Science	57%	76%
College Eng.	51%	73%
Eng I Below	49%	72%
Business	48%	66%
Soc. Science	55%	67%
Beg. Algebra	52%	67%

Recommendation 11

The variability among colleges in predicting students performance in particular courses demonstrates the need for individual institutions to conduct their own logistic regression analyses. It is likely that much of the variability in predicting student performance is due to differences among the colleges in teaching, grading and institutional practices.

Are there differences among ethnic groups in students' successful completion of classes?

At some colleges there were significant differences among ethnic groups in the percent of students entering with the same skills levels who successfully completed their classes. For the most part, however, among students who were appropriately placed, no one ethnic group did consistently better or worse than other groups within disciplines and across colleges. The procedures used in this study will enable colleges to evaluate their own results.

Recommendation 12

In addition to assessment data, colleges should examine factors such as institutional and instructional practices that may have influenced students' success in classes.

IMPLICATIONS OF THE STUDY FOR IMPROVING INSTITUTIONAL PRACTICES

IMPLICATIONS FOR ASSESSMENT

Use multiple criteria for course placement

The use of multiple criteria versus test scores alone would, for many courses, increase the accuracy of predicting whether or not students would pass their classes. In addition, the use of multiple criteria rather than test scores alone would have reduced the number of students who would have been denied access into courses in which they could have succeeded.

Include assessment of study skills

Study skills were seen by both faculty and students as being very important for students to succeed in their classes. Furthermore, faculty members in most classes surveyed reported that more than 70% of their students lacked study skills needed to succeed in their class. This finding strongly suggests that colleges should include measures of study skills in their decisions regarding course placements.

Explain clearly the importance of assessment information for advising

The information (test scores, educational background characteristics) used to place students in classes proved to be good predictors of students' success. Students should be informed of the relationship between the information collected during the assessment process and their probability of succeeding in particular categories of classes.

Re-examine the cut-off scores on assessment tests used in predicting students' success

The colleges should examine the cut-off scores on assessment tests in order to minimize errors in predicting students' success. These cut-off scores should be used in conjunction with other criteria in predicting students' performance in courses.

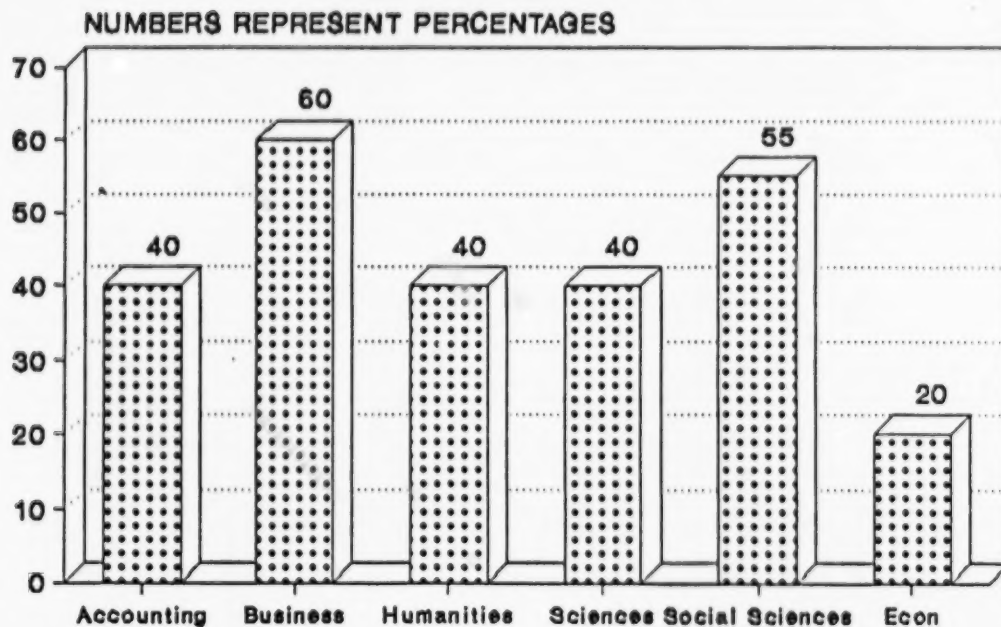
IMPLICATIONS FOR ORIENTATION & ADVISEMENT

Advise students based on profiles of successful students

During orientation or advisement sessions students should be provided with graphic illustrations on the probability of their succeeding in particular categories of entry-level courses. The profiles should be based on the multiple criteria that prove to be the best predictors of student success.

The following graph, using hypothetical data, illustrates how such information can be provided to counselors, advisors, and students.

Table 14
Course Advising for (name of student)
Fall Semester 1990
Probability of Passing Classes



Student Profile

Math Placement	Elementary algebra
English Placement	One level below college
Reading Placement	One level below college
H.S. G.P.A.	B-
Age	19
Units planned	12 or more
Hours employed	21-30
Highest math class completed	Intermediate algebra

Recommendations: Enroll in English 10 (1 level below college) and Math 7 (elementary algebra). Do not enroll in more than 12 units. Enroll in courses in which you have better than a 50% chance of passing.

Strongly recommend rather than mandate course placements for most courses

For some courses, particularly in the areas of English and math, the accuracy in predicting student performance using multiple criteria warrants consideration of establishing course prerequisites. However, for most courses, the criteria related to student success should provide the basis for strongly recommending as opposed to mandating appropriate course placements. This recommendation is based on the finding that the ability to predict students' success is far from perfect.

Provide students with specific suggestions on steps for succeeding in college

The orientation and advising sessions should include a component on skills students should acquire to increase their chances for succeeding in their courses. This recommendation is based on findings from the survey of students and faculty on skills needed for succeeding in courses and on the results of the logistic regression analyses.

IMPLICATIONS FOR INSTRUCTION

Identify and implement teaching strategies to assist students to succeed in their courses

A high percentage of students predicted to pass a course on the basis of assessment scores and educational background characteristics did not pass those courses. The factors used to predict student success were related to students' skills and characteristics prior to enrollment and did not take into account their interactions with students and instructors in the classroom. Therefore, colleges should examine institutional or instructional practices that may contribute to or detract from student success. The following are suggestions of steps that colleges should consider for increasing students' chances of succeeding in their classes.

- * Adjust curriculum where necessary to address students' learning needs. This may be achieved through such means as pairing study skills and reading classes with entry-level courses, incorporating study skills instruction into entry-level classes, offering modular skills classes, or adding preparatory courses for subject areas where students experience difficulty (e.g., economics, accounting).
- * Provide alternative approaches to delivering instruction such as collaborative learning or the use of instructional technologies.
- * Encourage faculty experimentation on the effectiveness of various instructional methods for achieving desired student learning outcomes.
- * Provide staff development opportunities for faculty to learn new approaches and technologies for delivering instruction and for assessing students' learning.
- * Develop strategies for encouraging students to take advantage of the resources provided at the college, e.g., interactions with faculty, use of support services, involvement in student activities.

IMPLICATIONS FOR RESEARCH

Establish recommended placement levels and course requisites based on statistically valid criteria

Researchers need to conduct logistical regression analyses to identify the factors that best predict student success in different categories of courses.

Examine cut-off scores on the assessment tests to minimize error in predicting students' success in courses

Researchers should identify the cut-off scores used for recommending course placements that minimize the number of false negatives and false positives.

Examine the relationship between the multiple criteria used to predict student success and students' grades on a midterm exam

This procedure would provide colleges with a closer approximation of students' ability to succeed in a class. Many factors in addition to students' skills and educational characteristics measured during the assessment process affect students' decisions to withdraw from a class during a term. These include illness, changes in employment and personal problems. The purpose of assessment is to advise students into courses in which they can succeed. Looking at the relationship between factors collected during assessment and the midterm grade reduces the influence of factors other than students' skills that may affect students' decisions to withdraw from a class.

Identify factors related to students' decisions to withdraw from classes

Variables that were good predictors of whether or not students would pass a course did not prove to be good predictors of whether a student would withdraw. Researchers need to see if there are factors not currently measured that are associated with withdrawal from courses.

Identify categories of courses in which similar skills are needed for students to succeed

It would be unwieldy to advise students using different criteria for each course in the curriculum. Researchers need to identify the criteria that best predict student success for each course and then combine those courses with similar criteria into categories (e.g., social sciences, physical sciences, biological sciences).

Identify course and instructional related factors necessary for success in particular categories of courses

Researchers should conduct a survey of students and faculty to identify the skills and motivational factors students need to succeed in their classes. Consideration should be given to measuring these factors during the assessment process.

Develop effective procedures for disseminating results on factors related to student success to college support staff, faculty and students

Researchers need to identify how the information will be used by various groups in order to design their reporting methods so each of the various groups can use the research findings in the most effective and efficient manner possible.

How can this study be replicated at other colleges and universities?

Colleges interested in replicating this study using their own data can do so by taking the following steps:

- * Collect relevant information that can be used in making decisions regarding initial course placements and establishing course prerequisites. This information should include assessment test scores, and educational and demographic background information. A good place to start is to look at the variables listed on *page 11* and those in *Table 9*.
- * Create a data file that combines assessment data and educational background information with students grades. This information is needed to predict student success. Instructions for creating the data file are described in *Kelemen-Lohnas and Elmore, 1989*, which can be obtained by contacting *Anne Stewart* at (805) 965-0581, ext. 354.

Course Placement & Prerequisites

- * As noted in this report, the appropriate statistical technique for using multiple variables to predict students' chances for success in courses is Logistic regression. A software package that was custom-designed for this project is available from:

Dan Steinberg
Salford Systems
5952 Bernadette Lane
San Diego, California 92120
(619) 582-7534
SYSTAT \$500,
SYSTAT w/SYSGRAPH \$695
LOGIT \$150

This software program is a module that is designed to be used in conjunction with *SYSTAT*, an easy statistical software package that can be used on microcomputers, a complete description of the *LOGIT* program and how to use it is described in *Kelemen-Lohnas, 1990*.

- * Additional assistance on implementing this project can be obtained by contacting Dr. Eve Kelemen-Lohnas at (805) 967-8738.

END

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